Tracheální intubace během kardiopulmonální resuscitace up-to-date 2018

MUDr. Josef Škola

20th Colours of Sepsis, Ostrava, 1. února 2018

KLINIKA ANESTEZIOLOGIE, PERIOPERAČNÍ A INTENZIVNÍ MEDICÍNY
FAKULTY ZDRAVOTNICKÝCH STUDIÍ UNIVERZITY J. E. PURKYNĚ V ÚSTÍ NAD LABEM
A KRAJSKÉ ZDRAVOTNÍ, a. s. – MASARYKOVY NEMOCNICE V ÚSTÍ NAD LABEM, o. z.

self, and to go on learning for the rest of his professional career. The new curriculum will also allow students to have a certain measure of choice of subjects, so that they may follow alternative paths according to their aptitude and desires. The clinics in the wards will be rearranged to be smaller, and it is hoped that students will take a more personal responsibility for their patients, and have laboratories in which to carry out the simpler investigations on them.

Another aim is to break down the barrier that tends to exist between the preclinical subjects on the one hand and the clinical subjects on the other. It would be wrong of me to prejudge a new curriculum that has not yet been put into operation, but I hope that the clinical importance of preclinical subjects will be stressed at an early stage in the course, though I agree with the view that the encouragement of critical habits of thought should be an objective of the teaching in the preclinical period. I am sorry that pharmacology is to be made a preclinical subject and that the happy union of pharmacology and therapeutics in fourth-year teaching has been dissolved. I hope, too, that the departments of pathology and bacteriology, now shown in the new draft programme as doing their teaching in the fourth

from the common purpose to indulge in internecine pyrotechnics.

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NOTES ON CARDIAC RESUSCITATION, INCLUDING EXTERNAL CARDIAC MASSAGE

BY

R. W. PORTAL, M.B., M.R.C.P.*

J. G. DAVIES

B. F. ROBINSON, M.B., M.R.C.P.

A. G. LEATHAM, M.B., F.R.C.P.

From St. George's Hospital, London

Apparatus for Maintaining Ventilation

The Portex "resuscitube" is probably the simplest airway for emergency use and enables "mouth-to-mouth" respiration to be carried out without direct contact with the patient. The Ambu resuscitator is convenient for manual inflation and may be used with a mask or endotracheal tube. Intubation is clearly the best method of ensuring an airway and should be performed as soon as possible after collapse. This technique might be more widely taught. If unskilled intubation proves difficult, time should not be lost and a temporary pharyngeal airway should be inserted.

A. G. LEATHAM, M.B., F.R.C.P.

From St. George's Hospital, London

JAMA | Original Investigation | CARING FOR THE CRITICALLY ILL PATIENT

Association Between Tracheal Intubation During Adult In-Hospital Cardiac Arrest and Survival

Lars W. Andersen, MD, MPH, PhD; Asger Granfeldt, MD, PhD, DMSc; Clifton W. Callaway, MD, PhD; Steven M. Bradley, MD, MPH; Jasmeet Soar, FRCA, FFICM, FRCP; Jerry P. Nolan, FRCA, FRCP, FFICM, FCEM (Hon); Tobias Kurth, MD, ScD; Michael W. Donnino, MD; for the American Heart Association's Get With The Guidelines–Resuscitation Investigators

JAMA. doi:10.1001/jama.2016.20165
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Key Points

Question Is tracheal intubation during adult in-hospital cardiac arrest associated with survival?

Findings In a study of 86 628 adults with in-hospital cardiac arrest using a propensity-matched cohort, tracheal intubation within the first 15 minutes was associated with a significantly lower likelihood of survival to hospital discharge compared with not being intubated (16.3% vs 19.4%, respectively).

Meaning These findings do not support early tracheal intubation for adult in-hospital cardiac arrest.

JAMA. doi:10.1001/jama.2016.20165
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Table 1. Patient, Hospital, and Event Characteristics Among Patients With In-Hospital Cardiac Arrest Without vs With Intubation in the First 15 Minutes of Resuscitation in the Full Cohort (continued)

Characteristic	Patients, No. (%)		
	Total (N = 108 079)	No Intubation (n = 36 464)	Intubation (n = 71 615)
In place at time of cardiac arrest			
Noninvasive assisted ventilation	11 117 (10)	8164 (22)	2953 (4)
Dialysis[c]	2912 (3)	944 (3)	1968 (3)
Implantable cardiac defibrillator	1913 (2)	539 (1)	1374 (2)
Intra-arterial catheter	4485 (4)	2209 (6)	2276 (3)
Electrocardiogram	80 864 (75)	30 069 (82)	50 795 (71)
Pulse oximeter	62 634 (58)	24 678 (68)	37 956 (53)
Vasoactive agents[d]	16 056 (15)	7822 (21)	8234 (12)

Table 1. Patient, Hospital, and Event Characteristics Among Patients With In-Hospital Cardiac Arrest Without vs With Intubation in the First 15 Minutes of Resuscitation in the Full Cohort (continued)

Characteristic	Patients, No. (%)		
	Total (N = 108 079)	No Intubation (n = 36 464)	Intubation (n = 71 615)
Location			
Emergency department	10 965 (10)	3695 (10)	7270 (10)
Floor with telemetry	22 215 (21)	6243 (17)	15 972 (22)
Floor without telemetry	27 249 (25)	6091 (17)	21 158 (30)
Intensive care unit	38 547 (36)	17 398 (48)	21 149 (30)

JAMA. doi:10.1001/jama.2016.20165
Published online January 24, 2017.

Association of Prehospital Advanced Airway Management With Neurologic Outcome and Survival in Patients With Out-of-Hospital Cardiac Arrest

JAMA. 2013;309(3):257-266

Association of Prehospital Advanced Airway Management With Neurologic Outcome and Survival in Patients With Out-of-Hospital Cardiac Arrest

praglottic airways (adjusted OR, 0.38; 95% CI, 0.36-0.40). In a propensity score–matched cohort (357 228 patients), the adjusted odds of neurologically favorable survival were significantly lower both for endotracheal intubation (adjusted OR, 0.45; 95% CI, 0.37-0.55) and for use of supraglottic airways (adjusted OR, 0.36; 95% CI, 0.33-0.39). Both endotracheal intubation and use of supraglottic airways were similarly associated with decreased odds of neurologically favorable survival.

JAMA. 2013;309(3):257-266

Co říká EBM?

Contents lists available at ScienceDirect

Resuscitation

journal homepage: www.elsevier.com/locate/resuscitation

Part 4: Advanced life support
2015 International Consensus on Cardiopulmonary Resuscitation and Emergency Cardiovascular Care Science with Treatment Recommendations☆,☆☆

Introduction

The optimal approach to managing the airway during cardiac arrest has been unclear, and several recent observational studies have challenged the assumption that advanced airways are necessarily superior to basic airway techniques.

Scientific Articles

Vol. LIV, No. 11 JOURNAL OF IOWA MEDICAL SOCIETY November, 1964

Community-Wide Cardiopulmonary Resuscitation

PETER SAFAR, M.D.
Pittsburgh, Pennsylvania

versible by prompt resuscitative efforts.[6] In the recent past there were about 90,000 accidental deaths per year, and 40,000 of those were due to highway accidents, in which injuries involving the head

HEART - LUNG RESUSCITATION

I FIRST AID: OXYGENATE THE BRAIN IMMEDIATELY

IF UNCONSCIOUS

Airway - *TILT HEAD BACK*

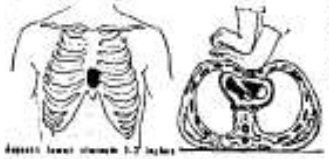
IF NOT BREATHING

Breathe - *INFLATE LUNGS 3-5 TIMES, MAINTAIN HEAD TILT*

MOUTH-TO-MOUTH, MOUTH-TO-NOSE, mouth-to-adjunct, bag-mask

- FEEL PULSE
- IF PRESENT - CONTINUE LUNG INFLATIONS
- IF ABSENT -

Circulate - *COMPRESS HEART ONCE A SECOND. ALTERNATE 2-3 LUNG INFLATIONS WITH 15 STERNAL COMPRESSIONS UNTIL SPONTANEOUS PULSE RETURNS.*



for physicians only

II START SPONTANEOUS CIRCULATION

Drugs - *EPINEPHRINE:* 1.0 mg (1.0 CC OF 1:1000) I.V. OR 0.5 mg INTRACARDIAC. REPEAT LARGER DOSE IF NECESSARY

SODIUM BICARBONATE: APPROXIMATELY 3.75 G/50 CC (1/2 DOSE IN CHILDREN) I.V. REPEAT EVERY 5 MINUTES IF NECESSARY

E. K. G. - • *FIBRILLATION:* EXTERNAL ELECTRIC DEFIBRILLATION. REPEAT SHOCK EVERY 1-3 MINUTES UNTIL FIBRILLATION REVERSED

• *IF ASYSTOLE OR WEAK BEATS:* EPINEPHRINE OR CALCIUM I.V.

Fluids - *I.V. PLASMA, DEXTRAN, SALINE*

Do not interrupt cardiac compressions and ventilation. Tracheal intubation only when necessary.

AFTER RETURN OF SPONTANEOUS CIRCULATION USE VASOPRESSORS AS NEEDED,

e.g. NOREPINEPHRINE (Levophed) I.V. DRIP

III SUPPORT RECOVERY (physician-specialist)

Gauge *EVALUATE AND TREAT CAUSE OF ARREST*

Hypothermia *START WITHIN 30 MINUTES IF NO SIGN OF CNS RECOVERY*

Intensive Care *SUPPORT VENTILATION:* TRACHEOTOMY, PROLONGED CONTROLLED VENTILATION, GASTRIC TUBE AS NECESSARY

SUPPORT CIRCULATION
CONTROL CONVULSIONS
MONITOR

Figure 1. The A, B, C of emergency resuscitation. These instructions have been arranged for the front and back of a billfold card or for a poster which may be obtained from the Pennsylvania Heart Association or the Pennsylvania Department of Health, Harrisburg.

CALCIU

I.V. PLASMA DEXTRAN, SALINE

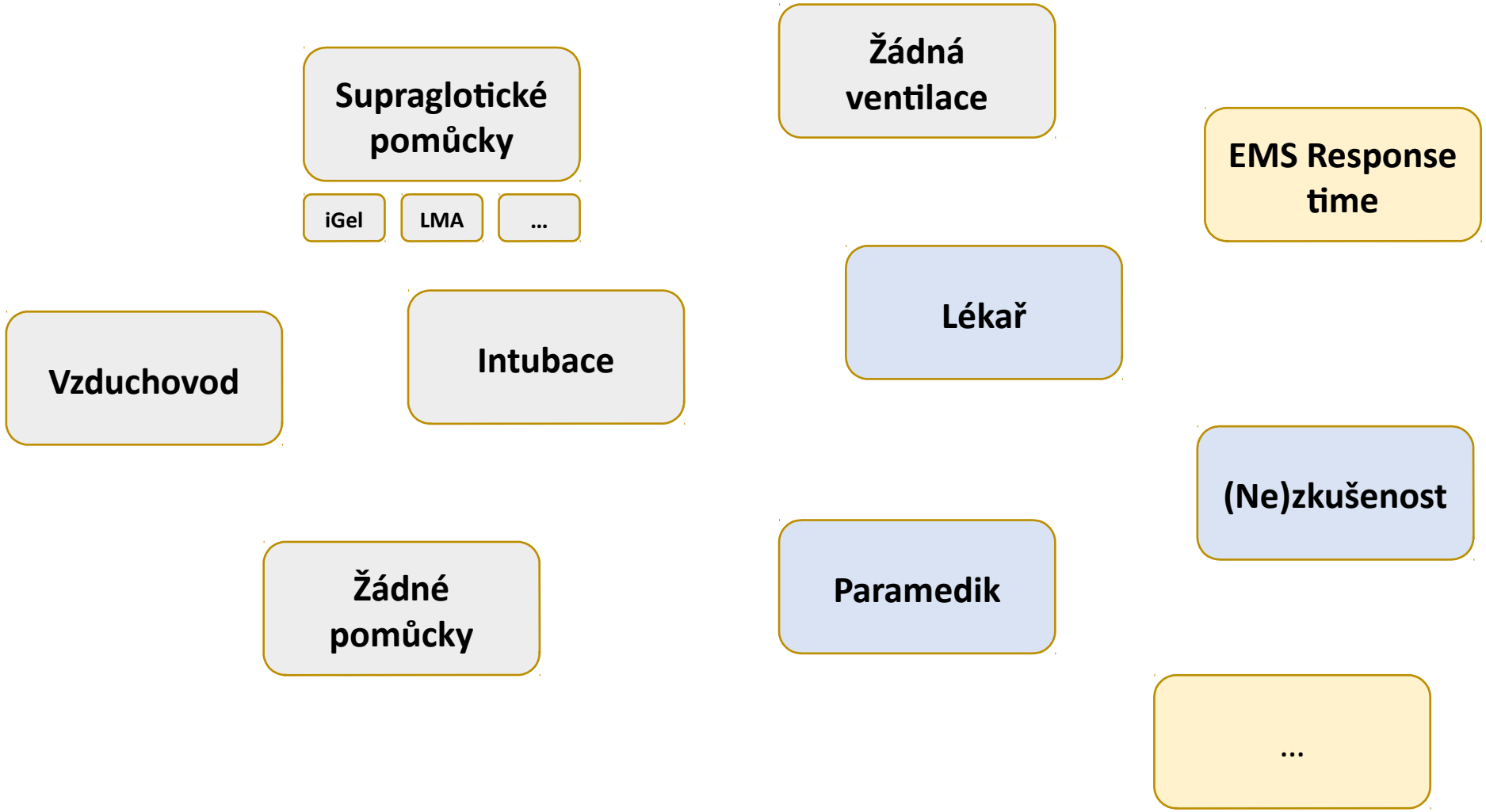
Do not interrupt cardiac compressions and ventilation.
Tracheal intubation only when necessary.

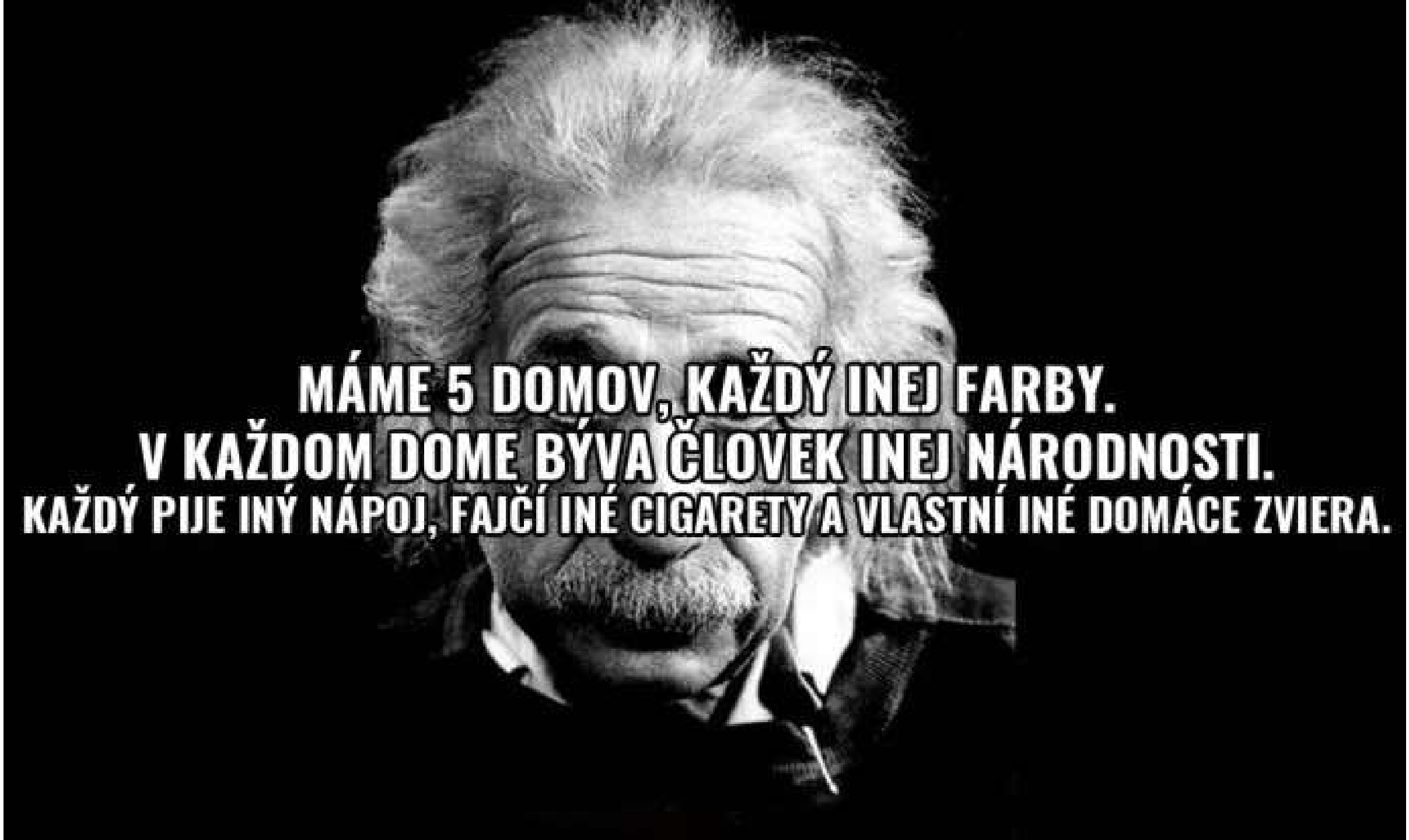
AFTER RETURN OF SPONTANEOUS CIRCULATION USE

e.g. NOREPINEPHRINE (Levophed) I.V. DRIP

RCT ?

Hrušky a jablka




MÁME 5 DOMOV, KAŽDÝ INEJ FARBY.
V KAŽDOM DOME BÝVA ČLOVEK INEJ NÁRODNOSTI.
KAŽDÝ PIJE INÝ NÁPOJ, FAJČÍ INÉ CIGARETY A VLASTNÍ INÉ DOMÁCE ZVIERA.

EINSTEINOVA HÁDANKA

Tuto hadánku vymyslel údajně sám Albert Einstein a tvrdil, že 98% lidí ji nedokáže vyřešit. Patříte mezi 2% nejchytřejších lidí na světě?

Fakta:

- Je 5 domů, z nichž každý má jinou barvu.
- V každém domě žije jeden člověk, který pochází z jiného státu.
- Každý z majitelů pije nápoj, kouří jeden druh cigaret a chová jedno zvíře.
- Žádný z nich nepije stejný nápoj, nekouří stejný druh cigaret a nechová stejné zvíře.

Nápověda:

- Brit bydlí v červeném domě
- Švéd chová psa
- Dán pije čaj
- Zelený dům stojí hned nalevo od bílého
- Majitel zeleného domu pije kávu
- Ten, kdo kouří PallMall, chová ptáka
- Majitel žlutého domu kouří Dunhill
- Ten, kdo bydlí uprostřed řady domů, pije mléko
- Nor bydlí v prvním domě
- Ten, kdo kouří Blend, bydlí vedle toho, kdo chová kočku
- Ten, kdo chová koně, bydlí vedle toho, kdo kouří Dunhill
- Ten, kdo kouří BlueMaster, pije pivo
- Němec kouří Prince
- Nor bydlí vedle modrého domu
- Ten, kdo kouří Blend, má souseda, který pije vodu

Otázka zní: Kdo chová rybičky?

řešení:

1	2	3	4	5
žlutá	modrá	červená	zelená	bílá
Nor	Dán	Brit	Němec	Švéd
voda	čaj	mléko	káva	pivo
kočka	kůň	pták	RYBIČKY	pes
Dunhill	Blend	PallMall	Prince	BlueMaster

Hrušky a jablka (a jahody a třešně..)

Supraglotické pomůcky

iGel

LMA

...

Žádná ventilace

EMS Response time

Lékař

Vzduchovod

Intubace

(Ne)zkušenost

Žádné pomůcky

Paramedik

...

Randomizovaná studie nepravděpodobná..

Předpoklady benefitu intubace

- pacient s NZO potřebuje umělou ventilaci..
- vlastní proces intubace během KPR nepoškozuje pacienta..
- ventilace cestou ETR nepoškozuje pacienta..

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- ventilace cestou ETR nepoškozuje pacienta..

Potřebují klinicky mrtví dýchat?

Chest Compression–Only CPR by Lay Rescuers and S… Cardiac Arrest

Zvýšení celkového přežití z 3,7% na 9,8%.
Celkové přežití ve skupinách:
- no CPR: 5,2%
- klasická CPR: 7,8%
- **CO-CPR: 13,3%**

Závěry:
CO-CPR byla spojená s vyšším přežitím.

Bentley J. B…
Daniel W. S…
Robert A. B…
Uwe Stolz, …
Arthur B. Sa…
Karl B. Kern…
Tyler F. Vad…
Lani L. Clar…
John V. Gallagher, MD
J. Stephan Stapczynski, MD

…rdiopulmonary resuscitation (CPR) may …athing for out-of-hospital cardiac arrest.

…nts with out-of-hospital cardiac arrest …ed with conventional CPR.

…spective observational cohort study of …f-hospital cardiac arrest between Janu… …a. The relationship between layperson …e was evaluated using multivariable lo…

Main Outcome Measure Survival to hospital discharge.

Results Among 5272 adults with out-of-hospital cardiac arrest of cardiac etiology not observed by responding emergency medical personnel, 779 were excluded because by… …a medi… …who re… …received …val [CI], …conven… …lds ratio …43), for COCPR vs no CPR, 1.59 (95% CI, 1.18-2.13), and for COCPR vs conventional CPR, 1.60 (95% CI, 1.08-2.35). From 2005 to 2009, lay rescuer CPR increased from 28.2% (95% CI, 24.6%-31.8%) to 39.9% (95% CI, 36.8%-42.9%; $P<.001$); the proportion of CPR that was COCPR increased from 19.6% (95% CI, 13.6%-25.7%) to 75.9% (95% CI, 71.7%-80.1%; $P<.001$). Overall survival increased from 3.7% (95% CI, 2.2%-5.2%) to 9.8% (95% CI, 8.0%-11.6%; $P<.001$).

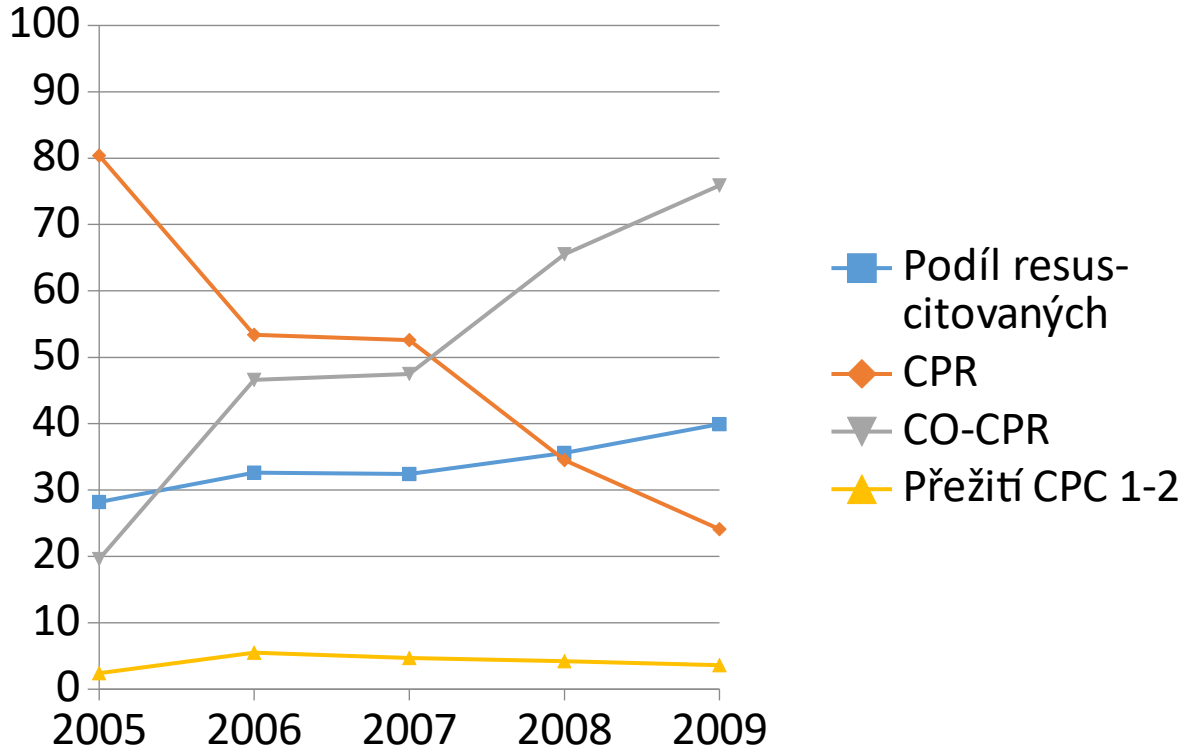
Conclusion Among patients with out-of-hospital cardiac arrest, layperson compression-only CPR was associated with increased survival compared with conventional CPR and no bystander CPR in this setting with public endorsement of chest compression–only CPR.

JAMA. 2010;304(13):1447-1454 www.jama.com

Je tedy možné zobecnit, že CO-CPR je lepší a měli bychom laiky učit pouze stlačovat hrudník?

…arrest is a major public health problem, affecting approximately 300 000 individuals in the United States annually.[1] Although survival rates vary considerably, overall survival is generally less than 10% among those in whom resuscitation is attempted.[2] The provision of bystander cardiopulmonary resuscitation (CPR) significantly improves outcome[3] but is generally per…

Chest Compression–Only CPR by Lay Rescuers and Survival From Out-of-Hospital Cardiac Arrest



2,4%	5,5%	4,7%	4,2%	3,6%
14	**52**	**39**	**42**	**35**

CLOSED CHEST CARDIAC MASSAGE

PETER SAFAR, M.D.* Pittsburgh, Pennsylvania

2. Can closed chest cardiac massage be relied upon to ventilate the lungs adequately? No. Previous studies of the role of airway obstruction in resuscitation and on the failure of chest-pressure artificial respiration seem to indicate that sternal pressure cannot be relied upon to produce adequate ventilation.[3-5] Further studies were performed in 1960 to determine the ventilatory efficacy of the sternal pressure produced

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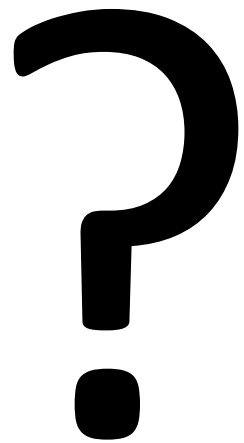


Předpoklady benefitu intubace

- pacient s NZO potřebuje umělou ventilaci..
- vlastní proces intubace během KPR nepoškozuje pacienta..?
- ventilace cestou ETR nepoškozuje pacienta..?

- riziko intubace do jícnu
- přerušení kompresí hrudníku
- selhání intubace až 50% (zkušenost?)
- obtížné získání a udržení dovednosti
- riziko hyperventilace
- riziko hyperoxie post-ROSC

- ventilace bez nutnosti přerušit komprese hrudníku
- efektivní ventilace
- minimalizace distenze žaludku / regurgitace / aspirace
- uvolnění rukou

Hyperventilation-Induced Hypotension During Cardiopulmonary Resuscitation

Tom P. Aufderheide, MD; Gardar Sigurdsson, MD; Ronald G. Pirrallo, MD, MHSA;
Demetris Yannopoulos, MD; Scott McKnite, BA; Chris von Briesen, BA, EMT;
Christopher W. Sparks, EMT; Craig J. Conrad, RN; Terry A. Provo, BA, EMT-P; Keith G. Lurie, MD

DOI: 10.1161/01.CIR.0000126594.79136.61

TABLE 1. Clinical Observational Study: Maximum Ventilation Rate, Duration, and Percentage of Time in Which a Positive Pressure Was Recorded in the Lungs (Mean±SEM)

Group	Ventilation Rate (Breaths per Minute)	Ventilation Duration (Seconds per Breath)	% Positive Pressure
Group 1	37±4*	0.85±0.07†	50±4%
Group 2	22±3*	1.18±0.06†	44.5±8.2%
Group 3	30±3.2	1.0±0.7	47.3±4.3%

*$P<0.05$; †$P<0.05$; group 1, first 7 consecutive cases; group 2, subsequent 6 consecutive cases (after retraining); group 3, groups 1 and 2 combined.

DOI: 10.1161/01.CIR.0000126594.79136.61

TABLE 2. Animal Protocol I: Changes in Hemodynamics and Arterial Blood Gases With Three Different Ventilation Rates Delivered in Random Order (Mean±SEM)

	Ventilation Rate, Breaths per Minute			
	12	20	30	*P*
Hemodynamics				
SAP, mm Hg	68.8±4.7	62.7±4.2	60.1±3.6	0.33
CPP, mm Hg	23.4±1.0	19.5±1.8	16.9±1.8	0.03
MIP, mm Hg per minute	7.1±0.7	11.6±0.7	17.5±1.0	<0.0001
Arterial blood gases				
pH	7.34±0.02	7.45±0.03	7.52±0.03	0.0006
$Paco_2$, mm Hg	22.7±2.7	15.6±2.2	11.6±1.5	0.005
Pao_2, mm Hg	340.9±40.7	403.3±47.0	403.7±48.0	0.59

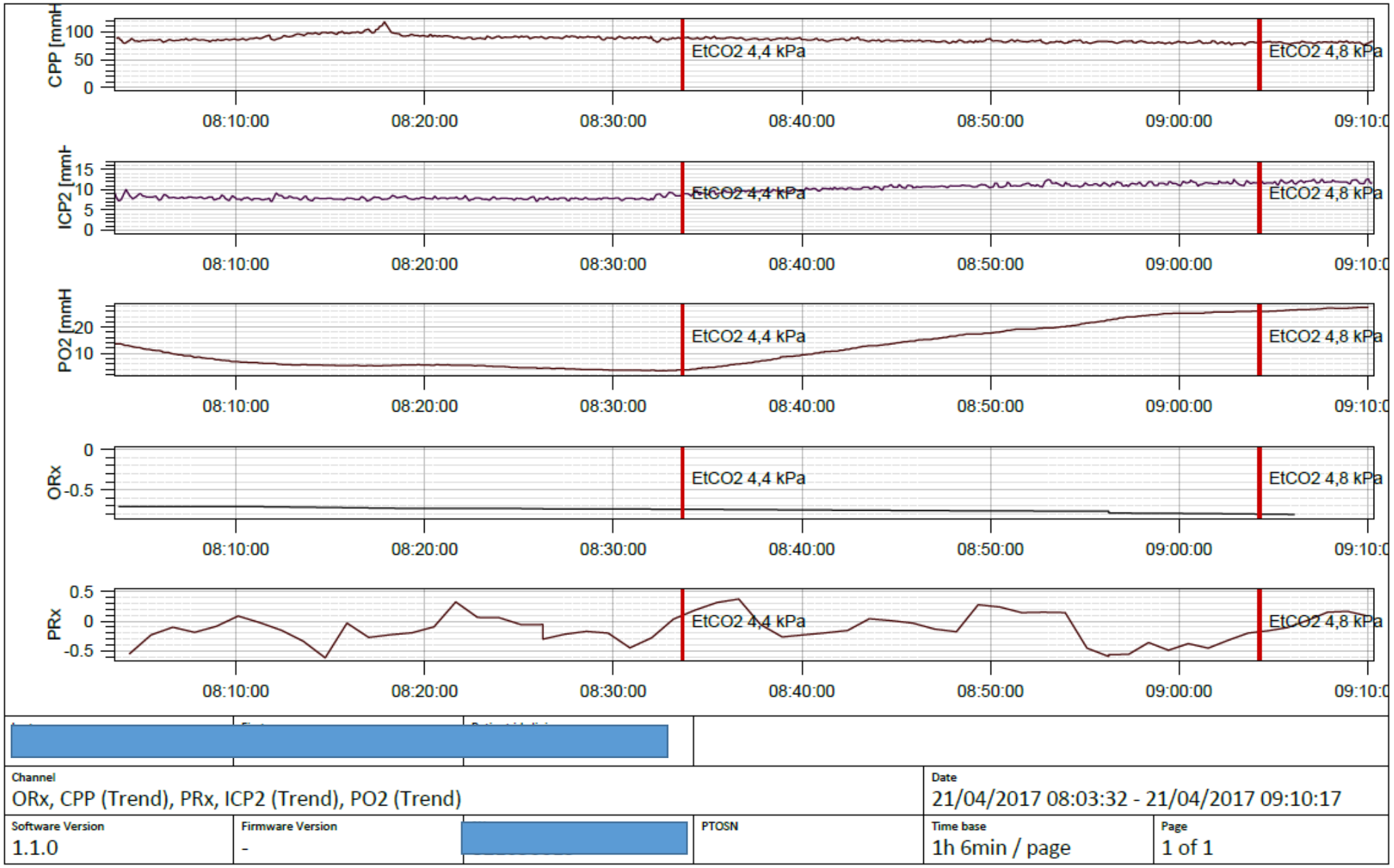
SAP, Systolic aortic pressure; CPP, coronary perfusion pressure; MIP, mean intrathoracic pressure.

DOI: 10.1161/01.CIR.0000126594.79136.61

Hyperventilace

- zvyšuje nitrohrudní tlak..
- snižuje koronární perfuzní tlak..
- snižuje žilní návrat..
- způsobuje hypokapnii..

Hypokapnie


CPP [mmH
100
50
0
EtCO2 4,4 kPa
EtCO2 4,8 kPa
08:10:00
08:20:00
08:30:00
08:40:00
08:50:00
09:00:00
ICP2 [mmH
15
10
5
0
PO2 [mmH
20
10
ORx
0
-0.5
PRx
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0
-0.5
Channel
ORx, CPP (Trend), PRx, ICP2 (Trend), PO2 (Trend)
Date
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Software Version
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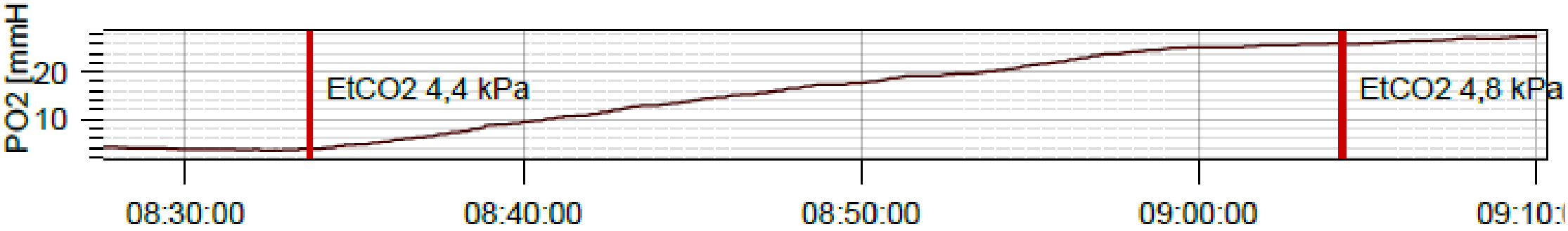
Hypokapnie a průtok krve mozkem



Association Between Arterial Hyperoxia Following Resuscitation From Cardiac Arrest and In-Hospital Mortality

J. Hope Kilgannon, MD
Alan E. Jones, MD
Nathan I. Shapiro, MD, MPH
Mark G. Angelos, MD
Barry Milcarek, PhD
Krystal Hunter, MBA
Joseph E. Parrillo, MD
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for the Emergency Medicine Shock Research Network (EMShockNet) Investigators

Context Laboratory investigations suggest that exposure to hyperoxia after resuscitation from cardiac arrest may worsen anoxic brain injury; however, clinical data are lacking.

Objective To test the hypothesis that postresuscitation hyperoxia is associated with increased mortality.

Design, Setting, and Patients Multicenter cohort study using the Project IMPACT critical care database of intensive care units (ICUs) at 120 US hospitals between 2001 and 2005. Patient inclusion criteria were age older than 17 years, nontraumatic cardiac arrest, cardiopulmonary resuscitation within 24 hours prior to ICU arrival, and arterial blood gas analysis performed within 24 hours following ICU arrival. Patients were divided into 3 groups defined a priori based on PaO_2 on the first arterial blood gas values obtained in the ICU. Hyperoxia was defined as PaO_2 of 300 mm Hg or greater; hypoxia, PaO_2 of less than 60 mm Hg (or ratio of PaO_2 to fraction of inspired oxygen <300); and normoxia, not classified as hyperoxia or hypoxia.

Main Outcome Measure In-hospital mortality.

JAMA. 2010;303(21):2165-2171

Association Between Arterial Hyperoxia Following Resuscitation From Cardiac Arrest and In-Hospital Mortality

Table 4. Outcomes of Study Patients

	All Patients (N = 6326)	Hypoxia (n = 3999)	Normoxia (n = 1171)	Hyperoxia (n = 1156)
In-hospital mortality, No. (%) [95% CI][a]	3561 (56) [55-58]	2297 (57) [56-59]	532 (45) [43-48]	732 (63) [60-66]
Survivors, No. (%)	2765 (44)	1702 (43)	639 (55)	424 (37)
Independent functional status at hospital discharge, No. (%) [95% CI][b]	939 (34) [32-36]	570 (33) [31-36]	245 (38) [35-42]	124 (29) [25-34]

JAMA. 2010;303(21):2165-2171

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journal homepage: www.elsevier.com/locate/resuscitation

Part 4: Advanced life support
2015 International Consensus on Cardiopulmonary Resuscitation and Emergency Cardiovascular Care Science with Treatment Recommendations☆,☆☆

Introduction

The optimal approach to managing the airway during cardiac arrest has been unclear, and several recent observational studies have challenged the assumption that advanced airways are necessarily superior to basic airway techniques.

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Treatment recommendation

We suggest using either an advanced airway or a bag-mask device for airway management during CPR (weak recommendation, very-low-quality evidence) for cardiac arrest in any setting.

Dopady do praxe..?

Dopady do praxe..?

Intubace během resuscitace ANO, ale:

- **rychle**
- **správně**
- **nehyperventilovat !!!**
- **vyvarovat se hyperoxemii post-ROSC.**

j o s e f . s k o l a @ k z c r . e u
w w w . k a p i m . c z